Tropentag, October 6-8, 2009, Hamburg

"Biophysical and Socio-economic Frame Conditions
for the Sustainable Management
of Natural Resources"

Material Investigations for an Efficient Auto Regulative Subsurface Irrigation Method with Permeable Pipes

Andrea Dührkoop, Christian Dede, Fokke Saathoff

University of Rostock, Institute for Environmental Engineering, Germany

Abstract

According to Food and Agriculture Organisation of the United Nations (FAO) irrigation consumes 70 % of surface and groundwater resources of the world. In developing countries this value may attain 95 %. Due to irrigation, climate change and population growth, in many countries water consumption exceeds the renewable water resources, leading to widespread groundwater depletion and water scarcity. It can be assumed that current irrigation methods use only a minor portion of the applied water, and that losses up to 60 % due to percolation, evaporation and water management are common. Thus, there is a crucial need to invest in affordable innovative and effective water technologies for achieving food security and economic growth.

One of an efficient irrigation system is the clay pot (pitcher) irrigation; it is a type of subsurface irrigation. The unglazed porous clay pot is embedded in the ground and filled with water, which eventually drains through the porous pot wall. Savings of up to 70 % compared with conventional irrigation methods were observed, as well as a significant reduction of fertiliser requirements, which greatly improves the economy of small-scale irrigation farming.

The authors present a research project which develops an innovative subsurface irrigation pipe following the pot-irrigation principle. Due to their specific material properties, the irrigation pipes are auto regulative, i.e. they release water depending on soil moisture and thus the plants' water demand.

The method offers an easy-to-use low-tech system. Compared with existing irrigation methods, the system owns a high saving potential in terms of water consumption as well as investment and operating costs. It is easy to handle and to maintain and environmentally sustainable. Against the background of the steady worsening of agricultural water supply, the project has a share in providing water and food security and thus prevents the spreading of poverty.

Comprehensive theoretical studies, including numerical modelling have shown the feasibility of the concept. At the Tropentag the authors will present first results of laboratory investigations for an adequate pipe material.

Keywords: Water productivity, effective water technologies, efficient irrigation system, irrigation, subsurface irrigation

Contact Address: Andrea Dührkoop, University of Rostock, Institute for Environmental Engineering, Justus-von-Liebig-Weg 6, LAG II, 18059 Rostock, Germany, e-mail: andrea.duehrkoop@uni-rostock.de